

Pinnacles National Park California Condor Reestablishment – Annual Report 2012



Pinnacle National Park Report

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Volunteers

Joseph Belli, Patty ten Boom Byrnes, Robert Brunet, Steve Chidester, Janea Elliott, Timothy Fuller, Jennifer Green, Jacob Isaacs, Kristen Kam, Robb Karman, Cassie Kovarik, Mandy Larson, Jana Mazor-Thomas, Jayne McDonagh, Tracy Moyle, Richard Neidhardt, Sean Parnell, Elizabeth Reikowski, Jan Shriner, Stephanie Spross, Jessica Stuart, Peter Szydlowski, and Barbara Van Gilder.

Interns

Elise Hinger, Jennie Jones, Zeka Kuspa, Nathan Melling, Arianna Punzalan, Eric Falquist, and others.

INTRODUCTION

California condors are one of the rarest birds in the world and biologists have been committed to recovery efforts for over three decades. The condor recovery program at Pinnacles National Park has several objectives, with the goal of species recovery in the wild.

Project objectives include:

- 1) monitoring central California condors foraging behavior and population trend, including nesting and reproduction;
- 2) detecting and recovering mortalities so cause of death can be determined;
- 3) managing threats to condors through treatment;
- 4) increasing public awareness of threats to condor recovery; and
- 5) conducting cooperative research to aid condor recovery.

Summary

During 2012, the Pinnacles National Park Condor Reestablishment Program managed a flock of 34 condors, tracking the birds over a range of approximately 90 miles north to south and 60 miles east to west. In 2012, there were three nests that involved Pinnacles released birds. No juveniles were released in 2012. There were three mortalities of Pinnacles managed condors in 2012.

METHODS

Population Monitoring

Condors are monitored year-round to document reproduction, mortality and movements. Condor health, foraging, flock interactions, and breeding behavior are monitored through visual observations. Biologists use standard equipment to radio-track and monitor condors including:

- Radio-telemetry receiver: Communication Specialists, Inc. Model R-1000
- Yagi antenna: AF Andronicus, Inc. Model F165-3FB and Model F164-165-3FB
- Omnidirectional antenna, magnetic mount: PCTEL
- Handheld GPS: Garmin etrex Vista HCx, Garmin etrex, Trimble Juno SB
- GPS receivers: Microwave Telemetry 45g Argos/GPS solar PTT-100 units for California condors, Photo 1
- Tail mount VHF transmitter: Holohil, Model RI-2CM(12)
- Patagial mount VHF transmitter: Advanced Telemetry Systems "micro." Model A5510 and "large" Model Custom2 for adult condor wing mount
- Patagial mount VHF solar transmitter: Merlin Systems, Inc. Model "Condor Wingmount"
- Remote video and still cameras



Photo 1. Microwave Telemetry GPS transmitter and wing tag

Survival Monitoring and Observations

Approximately one third of the central California condor flock is monitored remotely via GPS wing tags. GPS data are downloaded daily from CLS America and mapped in ArcGIS. Radio tracking within and around Pinnacles National Park is conducted five to seven days per week. Biologists use high points within Pinnacles to increase probability of hearing a signal. Monitoring outside of the park in San Benito County, portions of western Fresno County, and eastern Monterey County, is done using pullouts along public roads. Mortality signals or prolonged stationary GPS locations for condors are tracked down with handheld receivers and antennas to confirm dropped tags or the presence of sick or deceased condors. This activity takes priority above most others to maximize the chance of treating a sick or injured bird or retrieving a carcass before it decomposes. Data from daily tracking and monitoring, and all other activities described below, are entered into an Access database and Excel spreadsheets.

Trapping

Trapping condors is critical to maintain patagial vinyl identification tags and functioning VHF and GPS tags on as many individuals in the flock as possible. In coordination with Ventana Wildlife Society (VWS) staff, Pinnacles biologists conducted trapping twice in 2012 to measure lead levels in free-flying condors, perform transmitter maintenance, and conduct sampling related to collaborative research studies. The spring trapping

season was late April through late May, although opportunistic captures continued until June 9. Due to construction of a new flight pen for captive birds, the 2012 autumn trapping season was delayed. Trapping was conducted from September 21 to December 13 instead of from late August through October.

Before handling condors, biologists receive extensive training in handling, bleeding, and inspecting birds at the LA Zoo and from experienced co-workers who are already listed on Pinnacles National Park's US Fish & Wildlife Service (USFWS) recovery permit. Personal protective equipment (PPE) during handling includes eye protection, long-sleeved shirts and pants, closed-toe boots, leather gloves, and latex gloves for inspectors.

Nest monitoring

Biologists monitor active nest sites from survey locations 300-800 meters from the nest depending on topography. They perform nest entries when feasible to confirm egg incubation, hatching, nestling age, general health, behavioral interactions, adult-nestling feeding events, and fledging of young. Biologists enter active nests following standard procedures for egg-swapping and nestling checks, conducted at 30, 60, 90, and 120 days



of age. During nest entries PPE includes all appropriate climbing equipment, leather and latex gloves, etc. to ensure staff and condor safety. Biologists or a veterinarian check a nestling's blood lead levels, general health, and vaccinate it against West Nile Virus. Any high lead exposure in nestlings leads to evacuations and emergency response. Biologists sift nest sites for micro-trash (which is removed when found) and egg-shell fragments. Annual nest entry trainings are conducted at Pinnacles and "mini-trainings" are organized to keep staff experienced with relevant technical skills, Photo 2.

Photo 2. Nest entry training at Pinnacles.

Baiting

Biologists use “clean” food supplies acquired from organic dairies and place these carcasses approximately bi-weekly at one or two of the established bait stations in the park. These bait stations are the Grassy Canyon flight pen, Hilltop semi-permanent bait site, and Command Post temporary bait site. Established safety requirements include proper PPE, four-wheel drive training, and placement of carcasses by at least two biologists. Carcass placements are conducted at night to minimize interactions with condors and any associations with humans as food suppliers.

Remote Monitoring

Remote video cameras stationed at the captive facility and Hilltop bait sites record real-time data that biologists review to observe individual birds. Additionally, memory cards from motion-sensitive cameras at Command Post and Hilltop bait sites are retrieved each time food is placed and still photographs are reviewed for presence of birds and their weights. Weight data are collected using scales with perches mounted near bait. Still photos and video allow biologists to track the weight and general condition of free-flying condors.

Identifying Non-proffered Food

When condors are observed feeding on non-proffered food, biologists identify the species of the carcass when possible. Observing condors feeding on private land from public roads means carcass species identification is not always possible. Landowners are only contacted in reference to a carcass on their property when there is a specific concern, such as a carcass suspected of being contaminated.

Monitoring of Captive Birds

Captive condors are held at the Grassy Canyon facility (Photo 3) to minimize interactions



Photo 3. Captive facility and flight pen in Pinnacles National Park.

with humans. An electrified power pole at the flight pen delivers negative reinforcement to modify condor behavior and discourage them from landing at or near power poles when

they are in the

wild. During handling and prior to initial releases of young juveniles, biologists monitor captive condor health and interactions from the Grassy Canyon facility and through remote video.

Managing Risk

The main threat to the recovery of the central California condor population is lead exposure, predominantly from ammunition fragments in scavenged carcasses. Other risk factors may include micro-trash consumption, West Nile Virus exposure, electrocution at or near power poles, and human interactions. Pinnacles biologists adhere to standard procedures and established protocols to study and mitigate these risk factors.

Treatment

Lead exposure treatment

Not only does trapping condors allow for tag and transmitter maintenance, but it allows us to manage risk factors affecting their survival. In 2012, birds with blood lead levels above 35µg/dL or greater on a LeadCare Analyzer were held for chelation treatment. Condors with high lead levels were treated with calcium EDTA chelations at Pinnacles or transported to the Monterey Avian and Exotic Clinic or LA Zoo for radiographs, emergency treatment, or surgery.

Veterinary care

Biologists at Pinnacles are permitted to conduct basic first aid to superficial wounds discovered during handling. Any treatment requiring veterinary care is conducted by a permitted veterinarian or approved personnel in the field or at a clinic or zoo.

Vaccination

West Nile Virus vaccinations and boosters are administered on a schedule provided by collaborating veterinarians. In 2012, the protocol remained the same as in 2011, with a goal of vaccinating 100% of the flock on an annual basis. Pinnacles followed this protocol with the exception of those condors that were not captured.

Hazing

Hazing methods, which vary depending on location and availability of supplies, included clapping and running, clapping wood blocks together, use of a water cannon, and throwing pebbles near, but not at, a condor.

Collaborative Research

Pinnacles biologists work closely with researchers at USGS and the University of California (UC) at Davis and Santa Cruz to gather scientific data measuring condor responses to environmental risk factors. Blood samples collected during handling,

emergency responses, and nest entries were sent to both universities to confirm blood lead levels and to provide a basis for measuring isotopic signatures of lead in condors. Feather samples were sent to UC Santa Cruz to measure lead exposure events in individual condors over time. These data are being used to confirm which environmental lead sources condors are ingesting and how this affects condor health, behavior, and survival over time.

Outreach

Community, statewide, and large scale outreach all play a role in reducing the risk of condors being exposed to spent ammunition in carcasses on the landscape. The Pinnacles condor program has dedicated the time of one biologist to outreach and to working closely with the Institute for Wildlife Studies (IWS), VWS, and other partners to conduct outreach events and other activities. The Pinnacles outreach program includes: participation in hunter education workshops, shooting demonstrations, working directly with the community surrounding the park, and using a variety of means to educate all audiences on the health risks associated with lead ammunition.

Personnel

Implementing a long-term endangered species recovery program requires consistent staff capacity, which results in well-trained, experienced staff. The program at Pinnacles relies on two crew leaders, a bio technician, two interns, a Wildlife Health Coordinator and a program manager, all working full-time and primarily year-round.

Pinnacles condor volunteer program continued during 2012. Volunteers provide vital program support and receive extensive training prior to assisting in the field. Volunteers are asked to make a commitment to the program for a minimum of one day per month. They assist in tracking, field observations, and a wide variety of logistical tasks that support management of the species. In 2012 twenty-three volunteers contributed 1,938 hours. In addition, five interns contributed over 3,592 hours. The Condor Program could not accomplish all of its goals and objectives without the significant efforts and dedication of these individuals.

RESULTS

Population Monitoring

At the beginning of 2012, there were 34 condors (19 males and 15 females) in the central California flock managed by Pinnacles National Park. There were no successful nesting attempts by Pinnacles managed condors except for condor 306, which fledged a chick (condor 664) in Big Sur that will be managed by VWS. Two juvenile males (condors 602 and 606) from Los Angeles Zoo and one juvenile female (condor 626) from Oregon

Zoo were transferred to Pinnacles in November 2012 and scheduled for release in early 2013. There were three mortalities of Pinnacles managed condors (condors 478, 588, and 598). With the loss of three condors and the gain of three captive-reared, the total population of Pinnacles managed condors remained at 34, 19 males and 15 females. However, the total free-flying population fell to 31 condors prior to the release of juveniles in early 2013.

Survival Monitoring

Monitoring radio and GPS-tagged condors occurred on a near daily basis throughout 2012. Condors without functioning tags were observed opportunistically, often when they were near other birds being radio tracked. In total, there were 2,353 visual observations of condors by Pinnacles staff recorded in 2012. On 307 days of the year at least one visual observation was recorded. Any condor behaving abnormally was more closely monitored in an attempt to determine injury or illness and birds with GPS tags that did not move in over 24 hours were also given extra attention and observed whenever possible.

GPS data downloads provided staff with an efficient way to locate up to a third of the flock at a time and these data often directed where staff focused efforts for a given day. The central California flock used the landscape in all directions surrounding the park. Figure 1 maps the areas used by Pinnacles managed condors and provides a general

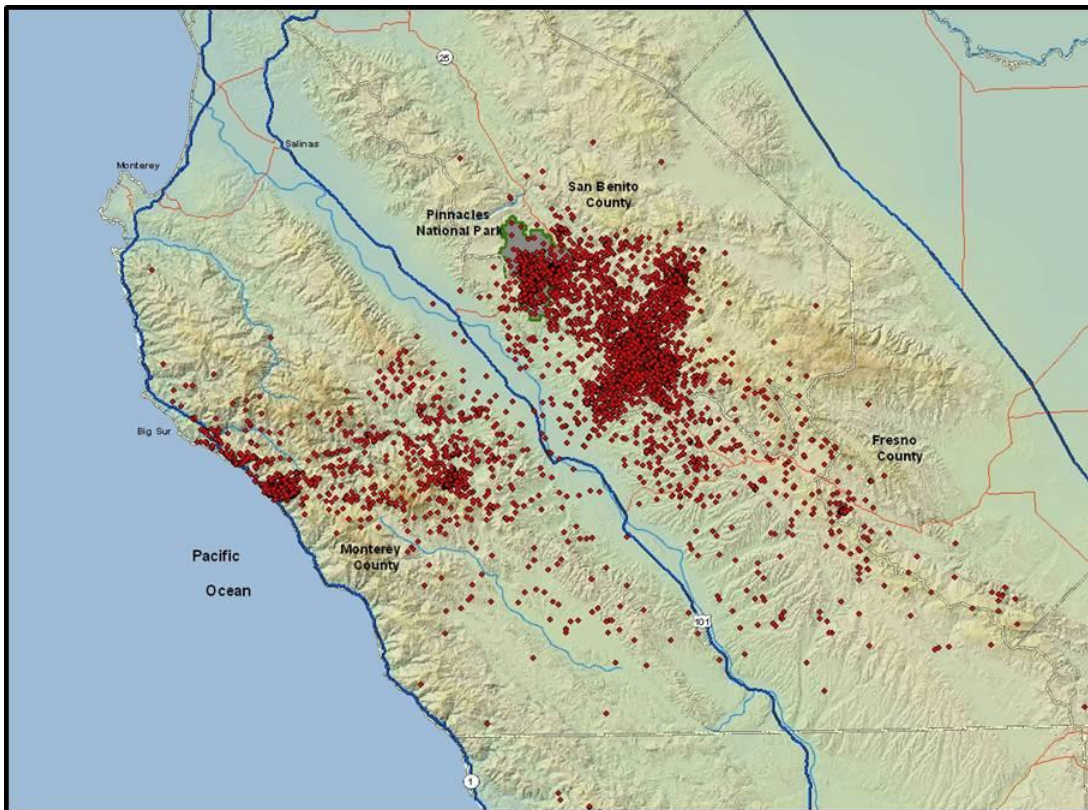


Figure 1. Location data from a selection of Pinnacles managed condors with functioning GPS tags in 2012.

view of the central California flock range based on some of the condors with GPS transmitters in 2012. Because condors are social, monitoring them via GPS transmitters adds great efficiency to locating all released condors, including those with no functioning VHF or GPS transmitters.

In 2012 there were three mortalities of Pinnacles managed condors: 478, 588, and 598.

478: Condor 478 died on April 21, 2012 at the LA Zoo. The necropsy performed by the Zoological Society of San Diego concluded the death was due to lead toxicosis. Condor 478 was a four year old male, hatched on April 23, 2008 at Peregrine Fund's World Center for Birds of Prey and released from Pinnacles National Park on October 3, 2009.

Beginning on March 27, 478 was only radio-tracked or seen near the property where he was later recovered. On April 6, 478 was observed with seven other condors and a number of ravens scavenging something in a field. No carcass was seen but there could have been either older remains or a smaller mammal. On April 10, an individual driving south on Highway 25 saw two Pinnacles staff members who were tracking outside of the park. The person had a photo of 478 near the road, said it looked sick and gave directions to the location. Condor 478 was located on private property approximately ten feet from Highway 25. Biologists contacted the property owner and were given permission to access. Biologist approached 478 with nets and it did not attempt to escape. He was placed into a kennel for immediate transport to the LA Zoo.

At the LA Zoo, 478 was radiographed and had two to three small opaque objects in the lower intestinal area. Under the care of Los Angeles Zoo staff, 478 was chelated, given intravenous fluids, antibiotics, and blood transfusions. He remained under close observations at LA Zoo until zoo staff found him dead in an ICU pen on the morning of April 22.

588: Condor 588 was found dead on July 29, 2012. The earliest possible date of death was July 21 based on radio signals and the latest was July 27 based on the landowner's sighting of the carcass. The necropsy performed by M. Varney and Dr. Stalis was inconclusive and the cause of death was not determined. Condor 588 was a two year old male, hatched on May 27, 2010 at Peregrine Fund's World Center for Birds of Prey and released from Pinnacles National Park on September 24, 2011.

On July 28, condor 588 had not been located for seven days so biologists radio tracked extensively outside the park. On the morning of July 29, a biologist heard mortality signals for 588 east of Pinnacles. Two biologists returned to the area to verify the location of the signal. While they radio tracked, the landowner came out and asked if they were looking for a dead bird. He had seen the carcass on July 27 but did not know who to call. He escorted the biologists to the location of the bird, in an open dirt field below a set of power lines. The carcass was already decomposed but was put on ice and shipped to San Diego Zoo Pathology Lab on July 30.

598: Condor 598 died on December 8, 2012 at LA Zoo. The necropsy was performed by Dr. Stalis, a pathologist at the Zoological Society of San Diego but a definitive cause of death was not identified. Condor 598 was a one and a half year old wild fledged female, hatched on April 7, 2011 in a nest cavity in San Benito County.

On December 4, 2012 in the afternoon 598 was trapped at Pinnacles for a routine handling. Project staff noted she appeared clumsy before she was trapped. Condor 598 was handled the following day. The Lead Care Analyzer gave a blood lead value of “High,” or $>65 \mu\text{g/dL}$. A later lead test performed at California Health and Food Safety Lab recorded a lead value of $53 \mu\text{g/dL}$. During handling no unusual behavior was noted, but the bird was dehydrated. She was started on chelation treatment, but could not receive sufficient subcutaneous fluids during handling. She was placed in a kennel and transported to LA Zoo on December 6. Upon arrival at the LA Zoo, 598 was chelated and radiographed, revealing 2 possible fragments in the lower gastrointestinal tract.

On the third day of treatment, December 7, keepers noted that 598 was easily netted and had enlarged air sacs. After treatment, the bird remained on the ground and did not attempt to move away when approached. Keepers continued close observation and noted that 598 was having difficulty breathing and did not eat. She was moved to a kennel in an isolation room. The next morning her labored breathing continued and she was taken to the LA Zoo Health Clinic for a full examination by Dr. Hill. Radiographs showed no obstruction and no fluid was heard in the lungs. She was placed on an oxygen mask but began to crash and was intubated and hooked up to a pulseox. Chest compressions were started and epinephrine was administered, but 598 died after several minutes.

Trapping

Trapping was conducted from late April to late May and early October through mid-December. In addition to scheduled seasonal trapping, some opportunistic trapping occurred throughout the year, when specific birds were targeted for transmitter replacement or other needs. Trapping in 2012 was challenging as more birds used areas outside of the park. This is likely to remain an issue in years to come. Nine Pinnacles managed condors were not trapped in either season in 2012. Capture data are summarized in Table 1, which includes Pinnacles and VWS managed condors caught at Pinnacles.

Table 1. Summary of Pinnacles trapping effort and captures of all central California flock condors at Pinnacles.

	Date Range	Total handling days*	Total captures**	Total individuals captured***
Spring	Late April to Late May	4	17	16
Fall	Early October to Mid-December	10	32	24
Yearly Total	All trapping	17	52	32

*days biologists handled any condors trapped at Pinnacles. These include condors caught for health checks, transmitter replacements, or as by-catch.

**number of condors trapped including multiple captures of the same individual during the given time frame.

***number of individual condors trapped at least once at Pinnacles.

Nest Monitoring

In 2012, there were three nests that involved Pinnacles released birds. Two of the nests failed prior to fledge.

251, 222, and 306 Nest

Central California had a condor nesting trio in 2012. Other release sites had confirmed successful breeding trios involving two males and one female. The nest along the Big Sur coast consisted of two females (VWS 222 and PINN 306) and one male (VWS 251). The nest was in a redwood tree that had been occupied in previous years. The egg was laid on March 14 and confirmed hatched on May 8. The female nestling was given studbook number 664. Because this was a trio, blood samples were analyzed for parentage and 306 was the dam. The trio successfully fledged 664 with all three adults participating in the nesting process (pers comm. J. Burnett, August 8, 2013).

317 and 318 Nest

The third condor nest within the boundaries of Pinnacles National Park since the beginning of the condor reestablishment program was confirmed this year in a cavity in a large rock formation. The pair (VWS male 318 and Pinnacles female 317) was first established in 2010 with their nesting attempt at Resurrection Wall, which failed due to lead toxicosis. Courtship behavior was seen throughout the winter of 2012 and egg incubation was confirmed in late January. The egg was laid around January 23 but the nest failed prior to the scheduled date for egg candling. Ravens were seen pecking at and scavenging the egg on February 17. It is unknown whether there was something wrong with the egg prior to the adult leaving the nest or if the ravens caused the nest failure. Fragments of eggshell were collected the next day. The pair doubled clutched after this initial nest failure, with a second egg lay date estimated on March 17. Their

second egg was in a different nest and failed due to unknown reasons on April 10. Staff had not observed the nest for several days and then noticed both parents perched together away from the nesting area. When the nest was entered, no egg shells were found. This pair did not attempt a triple clutch and therefore did not have a successful nesting cycle in 2012.

219 and 310 Nest

This existing breeding pair attempted to nest for the second time, having been successful in 2010 with the fledging of 574. This nest was only monitored indirectly through the movements of both adults due to its remote location. Based on the data, the location of the nest seemed to be the same as in 2010 in Los Padres National Forest. Based on GPS data from both parents, the estimated lay day was March 20. Condor 310 was taken into captivity for chelation treatment during incubation but 219 continued to incubate the egg, estimated to have hatched on May 18. The day before hatch, the male, 219, was trapped and had a high blood lead level. He was taken to Los Angeles Zoo for emergency treatment, leaving 310 to tend to the nest. Based on her GPS information, she remained at the nest until May 22. On May 24, 219 was released and returned to the nest that day, but did not remain at the nest cavity. Based on GPS, the nest failed no later than May 24.

Baiting

There were three locations that were used to feed out proffered carcasses at Pinnacles (Facility/Flight pen, Hilltop, and Command Post). Most of the carcasses that were fed were calves procured from organic dairies in Modesto, CA. In 2012, 84 calves, one pig, and four rats were fed. The majority of the proffered carcasses, 72 calves and four rats, were used to bait the Pinnacles Flight Pen and feed any condors that were captive there. We placed fewer carcasses in 2012 than in prior years because the flight pen was being remodeled from June-September and no carcasses were placed anywhere within Pinnacles during that time to avoid baiting birds into a construction area.

Remote Monitoring

Over 50,000 GPS locations were downloaded during 2012 from transmitters on 13 Pinnacles managed condors. To supplement radio and GPS monitoring, thousands of still photos and video hours were collected throughout the year. Still photos from cameras at bait stations, such as Photo 4, were reviewed regularly and video were reviewed as needed, such as when an individual without transmitters had not been located for an extended amount of time or for other reasons.

Non-proffered Food

Biologists observed condors feeding on non-proffered food a total of ten times with a total of 85 different visual observations of condors. Of those ten times, we were able to identify the species of carcass nine times: three cows, one coyote, two pigs, two rabbits, and one event with ground squirrels.



Photo 4. Photo taken with remote still camera.

Management

Facility Reconstruction

On June 9, all carcasses were removed from bait sites within Pinnacles in preparation for the reconstruction of our flight pen. Deconstruction began the following week and construction was completed by September 19. The timing for reconstruction altered our trapping schedule by shortening our spring trapping season and pushing back the start date for the fall trapping season. Once construction and clean up were finished, the facility was baited on September 20 and trapping efforts began the next day.

Treatment

Chelation

In 2012, nine Pinnacles condors were treated for elevated blood lead levels. Only one condor, 463, was treated a second time during the year. The threshold used to initiate chelation treatment was a blood lead value of $35\mu\text{g}/\text{dL}$ or greater on a LeadCare Analyzer. Both the LeadCare and LeadCare II Analyzers were used depending on whether the bird was handled at Pinnacles or in Big Sur. Chelation treatment for birds with lead values between $35\mu\text{g}/\text{dL}$ and $65\mu\text{g}/\text{dL}$ were treated in the Pinnacles Condor Care Unit when staffing allowed, Photo 5. All other treatments were completed at the Los Angeles Zoo.

Radiographs

In 2012, eight condors were radiographed after receiving elevated blood lead levels on a LeadCare Analyzer. Radiographs will show when any opaque objects are within the body. Based on the radiographs taken, condors with metal fragments in their

gastrointestinal tracts included: 340, 478, 589, and 598. Condors clear of objects were: 310, 400, 411, and 463. All radiographs were in response to elevated lead levels.



Photo 5. Pinnacles National Park Condor Care Unit

Surgeries

In 2012, condor 400 had a small foreign body removed from her right eyelid while at the LA Zoo. She recovered completely.

564 Case Study

On November 10, 2012 condor 564 was captured during the autumn trapping season. His field blood lead value was 38.8 $\mu\text{g}/\text{dL}$ so he was transported to the Condor Care Unit for chelation treatment. After one round of chelation the blood lead value dropped to 24.8 $\mu\text{g}/\text{dL}$ and, following protocol, he was placed in the Pinnacles Flight Pen on November 18. On November 20, 564 was handled for his first post-chelation lead check and returned to the pen with a blood lead value of 22.4 $\mu\text{g}/\text{dL}$. During his second post-chelation lead check on November 26, biologists noticed a crack on the left side of his beak. The crack was severe enough that pressure on the tip of the beak would potentially cause the front portion of the beak to break away. After consulting with LA Zoo staff, 564 was transported to the LA Zoo on November 29 where staff used a dremel to sand off the hooked portion of the beak and the remaining crack was sealed with medical glue. Condor 564 was brought back to Pinnacles the same day and released on

November 30. He was seen feeding at the facility on December 6 favoring the right side of the beak. The following week on December 13, 564 was seen feeding at the facility without any issues.

Vaccination

In 2012, 25 West Nile Virus vaccinations were given to 23 Pinnacles condors. Two condors were given a vaccination in both the spring and the fall. Of the eleven Pinnacles condors not vaccinated, two had died prior to being trapped and nine were not captured at all.

Hazing

There were 18 hazing events involving 16 Pinnacles condors in 2012. The condors were hazed for a variety of reasons and using several different methods. Several birds, 340, 411, 431, 525, and 550 were hazed at the Pinnacles Facility during construction or handling days. Condor 588 was hazed from the High Peaks due to his proximity to a park trail and visitors. Twelve Pinnacles condors (317, 330, 335, 351, 400, 411, 418, 438, 460, 525, 543, and 550) were hazed by Pinnacles and VWS staff due to their proximity to a road. There were also several hazing events by VWS staff of condors in the Big Sur area. Of the 16 Pinnacles condors hazed, seven had to be hazed more than once: 550 was hazed five times; 335, 351, 411, 418, and 525 were hazed three times; and 460 was hazed twice.

Collaborative Research

Case Study of Lead-related Mortality

Researchers at UC Santa Cruz will be conducting a comprehensive assessment postmortem of 1-2 condors whose deaths were linked to lead poisoning. This research will provide additional critical information on lead exposure events in California condors. Lead isotopic composition and concentration analysis of multiple tissues (e.g., bone, liver, kidney feather, blood) will produce a detailed assessment and generate information needed to document the birds' lead exposure history, as well as identify possible lead sources that the condor was exposed to prior to death.

Feather and Blood Lead Isotopic Fingerprinting

Evaluating lead concentrations and isotopic compositions in sequential feather segments from individual birds provides critical information on the degree, frequency, and severity of lead exposures in California condors. In 2012, Pinnacles continued collaboration with Dr. Don Smith's Environmental Toxicology laboratory at UC Santa Cruz on projects analyzing blood and feather samples for lead concentration and isotopic ratios. In support of this research, we measured and marked at least one growing feather when a condor was trapped if they had any growing primaries at the time, Photo 6. If a condor had molted a previously sampled feather, we collected another sample when possible. During 2012, a total of 35 feathers were notched for

measurement on 26 individual condors, Photo 6. There were 69 measurements made during the year. We also collected one feather sample each from seven individuals.

In addition to feather studies, blood lead isotope ratios were analyzed at UC Santa Cruz. During each initial handling of a condor we collected a blood sample and, when possible, a second sample was collected at a later date. In total, Pinnacles staff collected 41 blood samples from a total of 29 condors for this study. Condor isotopic ratios can be compared to ammunition and other possible sources of lead exposure. The results of this research are pending publication.



Photo 6. Notching growing feathers for measurement.

Feather Growth Rates

If a condor was held in the facility for a week or longer for chelation or another management issue, or if a bird was trapped twice while a single feather was growing, biologists collected feather length measurements on multiple dates on the same primary feather. The goal of these measurements is to determine how consistent feather growth rates are over time.

Recovery Program Lead Sampling

Biologists at Pinnacles continued semiannual condor blood lead level sampling during spring and fall trapping in 2012. Additional blood samples were collected at other times of the year when a condor was trapped for transmitter maintenance or other needs. Blood samples were sent for lead analyses to the UC Davis Animal Health and Food Safety Laboratory or Louisiana State University. Labs conduct more precise testing than Lead Care Analyzer kits, which are best suited for field use. Results of these analyses were provided to the USFWS and are not included here.

Trash in Condor Nests

During condor nest entries, biologists inspected the nest surface and sifted the substrate to document the presence of any anthropogenic material. When nestlings are present biologists palpate them to identify foreign material when possible. In 2012, neither of the two nests used by 317 and 318 had trash in them. Due to its remote location, the nest used by 219 and 310 was not entered. We will continue to remove trash from condor nests and determine quantity, type, and mass of trash collected.

Chelation Effectiveness

To better understand chelation effectiveness in California condors, we took blood samples from birds that required treatment after they received two and four chelation treatments and then analyzed these samples for their lead values. These data should indicate how fast chelation treatment reduces the lead load in condors. Additionally, we assessed natural lead depuration when treatment was not given. This was done by collecting blood samples once per week for a two week period from condors with field lead values >25 and <35µg/dL. These data may help inform future chelation effectiveness research.

Outreach

Pinnacles condor program has a unique opportunity as a release site within a National Park, where thousands of visitors from all over the country and the world come to explore. Part of our role as a park includes providing information to the public and increasing their awareness of the natural resources we protect in the park, and those that rely on the landscape surrounding us.

Throughout the year, biologists and interpreters at Pinnacles were available along trails while radio tracking condors to provide informal, outdoor educational opportunities to park visitors. In 2012, biologists spoke with over 1,100 visitors on trails and approximately 80 visitors at the campground. In addition, while Pinnacles staff radio tracked outside of the park they discussed the program with approximately 80 individuals. In 2012 we provided interpretive programs to school groups and volunteer groups both at Pinnacles and at alternate locations outside the park to raise awareness about condor biology and management issues. Pinnacles condor program biologists

spoke with approximately 370 individuals at events outside the park and over 100 visitors during field trips to the park.

The Blue Ribbon Panel report (Walters et. al. 2008) identified lead outreach as one of the most important tools that can positively impact condor recovery throughout California. Pinnacles staff employed varied outreach funds and efforts to educate diverse groups on the impacts of lead on condors, other wildlife, human safety, and the benefits of removing lead from the landscape.

Targeted Non-lead Outreach

Targeted non-lead outreach by Pinnacles Wildlife Health Coordinator, the Institute for Wildlife Studies (IWS), and efforts coordinated with VWS and USFWS are summarized below, Table 2. These efforts include contacts involving NPS staff, but additional efforts by IWS and others (supported by NPS and other funding sources) generate many more contacts with the public and interest groups.

International Sportsman's Expositions in collaboration with IWS

- Denver, CO – NPS/IWS – 1, 010 contacts
- Sacramento, CA – NPS/IWS – 969 contacts

California Department of Fish and Wildlife Advanced Hunter Education Clinics:

- Yolo County – Black Powder Clinic – NPS/IWS – 30 participants
- Canada de los Osos – Deer Clinic – NPS – 40 participants
- Sonoma – Pig Clinic – NPS/IWS – 40 participants

Pinnacles NP Law Enforcement Collaboration

- Coordinated demonstrations from Custom Cartridge and law enforcement on high performance non-lead tactical ammunition.
- Ballistic testing for law enforcement tactical ammunition

Shooting Demonstrations in collaboration with IWS with USFWS support

- Kernville – NPS/IWS – 12 participants
- Visalia – NPS/IWS – 32 participants
- Los Angeles – NPS/IWS – 75 participants

NPS Workshops:

- Zion National Park – NPS – 74 participants
- Pinnacles National Park– NPS – 40 participants

Presentations

- Pinnacles Westside Speaker Series – S. Scherbinski (NPS) - *Wildlife and Working Landscapes: Finding Common Ground* – 8 participants
- Presented at Pesticide Applicators workshops

- Santa Maria, CA – D. George (NPS) - *What Scavengers Have Taught Us About Environmental Contaminants* – 120 participants
- Salinas, CA – S. Scherbinski (NPS) – *Wildlife and Working Landscapes: Finding Common Ground* – 150 participants
- Society for Conservation Biology North American Congress – D. George (NPS) - *Removing Lead From The California Condor Landscape Through Outreach* – 30 participants
- Safari Club International Bay Area Chapter – S. Scherbinski (NPS) - *Wildlife and Working Landscapes: Finding Common Ground* - 18 participants

Table 2. Pinnacles and partner outreach events in 2012, summarized by type.

Outreach Event Type	Direct Contacts
International Sportman's Expositions	1979
CA Dept of Fish & Wildlife Hunter Ed Courses	110
Shooting Demonstrations	119
NPS Workshops	114
Presentations	326
TOTAL	2648

Some additional outreach methods are more difficult to quantify the number of people reached and include: media, requests for assistance from partners, electronic toolkits sent to other NPS units or other organizations, NPS unit coordination, and the production of outreach material for public information.

Media

- *Taking the Lead on Pb* video produced in partnership with Theodore Roosevelt National Park
- Oakland Zoo educational video to be used in opening condor exhibit
- National Parks magazine article, Kelly Bastone
- Oregon Public Broadcasting: Oregon Field Guide Episode, November 15, 2012.

NPS Expertise Sought

- Ventana Wildlife Society – partner in development and implementation of Free Non-Lead Ammo Program - ~1300 boxes of ammo distributed
- USFWS – Midwest Region – request for photos and collaboration on outreach materials
- USFWS – Western Region – request for materials for presentation to USFWS National and Regional Directors
- Yurok Tribe
 - request for letter of support to expand existing outreach program in the Northwest

- request for support and training on organization and conducting shooting demonstrations
- Nova Scotia – request for outreach materials

Electronic Toolkits

- 16 toolkits distributed to 11 government, non-profit, and other organizations

Coordination with other NPS units

- North Cascades National Park – visit with wildlife biologist to discuss hunting and lead impacts
- Lake Roosevelt National Recreation Area - exchange ideas and information on outreach to hunters and fishermen
- Mojave National Preserve – IWS attended annual Youth Dove Hunt in October
- Theodore Roosevelt National Park – collaborated with THRO to create an educational 10 minute film, "Taking the Lead on Lead" as well as providing their elk reduction program educational materials and technical expertise for non-lead culling of elk

Outreach materials are revised and updated throughout the year.

General Community Outreach

Pinnacles National Park is surrounded by private lands which provide condors and many other native wildlife species with needed habitat. Pinnacles outreach program includes building relationships with land owners and managers to foster communication, help address any human/wildlife conflicts, and to build trust within the community. Ranching and hunting lifestyles are not only compatible but are necessary to support condor recovery in central California. Working together with the community we hope that these traditions remain viable in the lands surrounding the Park. We request permission to access private land as needed to follow up on dropped transmitters, GPS-tagged birds that have not moved in more than one day, or possible nesting activity. These meetings, and mobile tracking along public roads, create opportunities to answer questions about the condor program and interact in person with land managers and owners who can have a direct positive impact on condor survival.

RECOMMENDATIONS AND DISCUSSION

Monitoring

Maintaining staff capacity and efficient monitoring creates a well-rounded program that includes outreach and research components that are coordinated with condor management. GPS transmitters have increased monitoring efficiency and made observations of condors in the wild more likely as staff know where to focus their efforts while mobile tracking after viewing downloaded GPS data. With a greater number of GPS transmitters deployed we could streamline our monitoring further while

simultaneously collecting more data. In addition, while nest monitoring via radio tracking, observations, and, at times, GPS transmitters is sufficient to determine nest location and outcome, it cannot necessarily address questions on the fate of an egg or nestling. We recommend increasing the number of central California flock fitted with GPS transmitters and installing nest cameras whenever possible in future years.

Management

With a total of nine condors treated for lead exposure in 2012, we recognize that lead in the environment remains the primary threat to condor recovery in the central California flock at this time. Condors will continue to use the private lands surrounding Pinnacles National Park and that land offers excellent foraging and roosting habitat. Addressing the threat of lead on both public and private land will remain a need in the coming years, as will providing the best care possible to condors exposed to lead. In particular, a greater understanding of the efficacy of chelation treatment will help all condor recovery programs and release sites determine when it is most useful. We recommend chelation treatment for condors be further researched and reviewed to increase our understanding of the options it provides. NPS has received some funds for a chelation efficacy research study that will begin in late 2014.

Research

Each research project conducted to date has informed management decisions that affect the recovery of the species. Pinnacles biologists continue to work closely with researchers and we will continue to prioritize the collection of samples and data that support scientific research. With funding for research limited, we recommended condor programs at different release sites work together and discuss highest priority needs, research proposals, joint funding opportunities, and collaboration on a yearly basis.

Outreach

Outreach efforts were sustained throughout the year and continue into 2013. These efforts are critical to informing the public's perception of non-lead ammunition and understanding how lead affects all wildlife species. Outreach events give us the opportunity to highlight the importance of a hunter's role in condor recovery and how hunting, as well as ranching, provides forage and habitat for the condor.

Outreach is not a short-term effort but builds over many years. Changes in attitude toward lead in the environment are happening. These changes have been observed over multiple years while participating in the same sportsman's events. However, because changes in attitudes occur slowly, an immediate reduction in condor lead exposure is unlikely. That will likely take many more years. Development of a social metric to gauge changes in awareness of lead impact to wildlife health and the transition to non-lead ammunition would increase our ability to monitor the effectiveness of outreach efforts over time.

Developing strong partnerships will continue to be an important step in successful outreach efforts. Fostering inclusion and cooperation while addressing the issue of lead exposure will help us understand and appreciate our audience and partners better. As new partnerships are developed we will increase our capacity for outreach and ability to work toward a positive solution.

On a local level we continue to provide local residents our contact information (for incidents like condor 588's carcass recovery). Mobile tracking provides opportunities for biologists to interact with the public and communicate directly with local landowners. We continue to build relationships with our surrounding community to increase communication, which supports many aspects of our program. We recommend condor recovery programs across the western US work together on an outreach program, based on scientific information, which diverse audiences can understand. Each program can learn from the successes of others to date and fine tune messaging that is best suited for the audience they work with most. At Pinnacles, we will continue with outreach at multiple scales, including our surrounding community.

CITATIONS

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